

Appl. No. 10/782,027

Attorney Docket No. 03-0266 (Formerly 370044-00002)

Amdt. Dated November 29, 2006

Reply to USPTO Communication of August 29, 2006

Amendments to the Specification:

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0020 (Specification as-filed, Page 4, lines 1-2) with the following amended Paragraph 0020:

[0020] FIG. 6b is a picture demonstrating the grain size of Alloy 6022 rolled in-line to 0.035 inch gauge with pre-quench.

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0022 (Specification as-filed, Page 4, lines 4-5) with the following amended Paragraph 0022:

[0022] ~~Figure~~ Figures 7b and 7c ~~consists~~ consist of two ~~pictures~~ micrographs demonstrating the surface and shell structure of Alloy 6022, respectively, in as-cast condition in transverse section.

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0023 (Specification as-filed, Page 4, lines 6-7) with the following amended Paragraph 0023:

[0023] ~~Figure~~ Figures ~~[[7c]]~~ 7d and 7e ~~is a picture~~ are micrographs of the center zone structure of Alloy 6022 in as-cast condition in transverse section.

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0024 (Specification as-filed, Page 4, lines 8-10) with the following amended Paragraph 0024:

[0024] ~~Figure~~ Figures ~~[[7d]]~~ 7f and 7g ~~consists of two pictures~~ are micrographs demonstrating occasional small pores and constituents (mainly AlFeSi and some Mg₂Si particles) in the center zone of Alloy 6022 cast structure in transverse section.

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Please replace US Published Application US 2005 /0183801 A1, Paragraph 0054 (Specification as-filed, Page 12, line 8-18) with the following amended Paragraph 0054:

[0054] Sheet at finished gauge was examined for grain size and was found to have a mean grain size of 27 μm in the longitudinal and 36 μm in the thickness direction, FIG. ~~[[6]]~~ 6a. This is substantially finer than that of 50-55 μm typical for sheet made from ingot. Since a fine grain size is recognized to be generally beneficial, it is likely that a part of the good/superior properties of the sheet made by the present method was due to this factor. It was found that even finer grain size could be obtained in the present method by rapidly cooling the strip to about 700° F before it is rolled. This effect is illustrated in FIGS. 6a and 6b where the two samples are shown side by side. The grain size of the cooled sample (FIG. 6b) was 20 μm in longitudinal and 27 μm in transverse direction, which are 7 and 9 μm , respectively, finer than those observed in the sheet which had no pre-quench cooling (FIG. 6a).

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0055 (Specification as-filed, Page 12, line 19 – Page 13, line 16) with the following amended Paragraph 0055:

[0055] Samples of as-cast strip were quenched and examined metallographically to further understand the benefits of thin strip casting. The samples showed the three-layered structure characteristic of the Alcoa strip casting process, Figure 7a. The surfaces of the strip were clean (no liquation, blisters or other surface defects) with a fine microstructure, ~~Figure~~ Figures 7b and 7c. Unlike the material continuously cast by Hazlett belt casters or roll casters, the strip of the present method showed no centerline segregation of coarse intermetallic compounds. On the contrary, the last liquid to solidify had formed fine second phase particles

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between grains in a center zone that covered about 25% of the section, Figure Figures [[7c]] 7d and 7e. This absence of a marked centerline segregation in the present method provided the good mechanical properties observed, especially in the equi-biaxial stretch tests. Most of the second phase particles observed were AlFeSi phase with an average size $<1\ \mu\text{m}$, Figure Figures [[7d]] 7f and 7g. Some Mg_2Si particles were seen in the center zone of the sample, but none was noted in the outer "shells", Figure Figures 7b and 7c. This suggested that the rapid solidification in the caster was able to keep the solute in solution in the outer zones of the structure. This factor, combined with the fine overall microstructure of the strip (see Table 4), enabled the complete dissolution of all solute at substantially lower solution heat treatment temperatures of $950^\circ\text{--}980^\circ\text{F}$ than 1060°F that would be needed for sheet prepared from DC ingot.

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0066 (Specification as-filed, Page 17, lines 1 -- 9) with the following amended Paragraph 0066:

[0066] The alloy was cast to a strip thickness of 0.086 inch at 240 feet per minute speed. It was rolled to 0.04 inch gauge in one step, flash annealed at 950 F, following which it was water quenched and coiled. The quenching of the rolled sheet was done in two different ways to obtain O temper and T temper by different settings of the post quench 63. For the T temper, the strip was pre-quenched by quench 53 to about 700 F before warm-rolling to gauge and was post-quenched to 170 F (~~sample #: 804995 in Table 6~~). In a second case, the sheet was post quenched to around 700 F and was warm coiled to create O temper. The O-temper coil was done both by warm rolling (~~sample: 804997~~) and by hot rolling (~~sample: 804999~~).

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Please replace US Published Application US 2005 /0183801 A1, Paragraph 0067 (Specification as-filed, Page 17, lines 10 – 20) with the following amended Paragraph 0067:

[0067] Performance of the sheet was evaluated by uniaxial tensile tests on ASTM--4 d samples and by hydraulic bulge test. In the T temper, the sheet showed tensile yield strength, ultimate tensile strength and elongation values well above the requirements for alloy 5754 in O-temper and as good as those available in sheet made by the conventional ingot method[[, Table 6]]. In the hydraulic bulge test, too, the performance of the T temper AX-07 was very close to that of alloy 5754[[, FIG. 8]]. This suggests that AX-07 in T temper made by the method of the present invention can be used to replace the 5754 sheet in inner body parts and reinforcements in auto applications. Such a replacement would have the advantage of making those parts recyclable into the 6xxx series alloys, by virtue of the lower Mg content, used in outer skin parts of autos without the need for separation.

Please replace US Published Application US 2005 /0183801 A1, Paragraph 0068 (Specification as-filed, Page 17, lines 21 – 25) with the following amended Paragraph 0068:

[0068] Samples were also tested in O-temper made by the present method. In that temper, the strength levels were lower, around 8.8 ksi yield strength and 23 ksi tensile strength. The performance in the hydraulic bulge test improved equaling that of conventional 5754 ~~as may be seen in FIG. 8~~. This temper thus offers a material that would be formed more easily at lower press loads.